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Effect of some chemical nutrients on the mycelial growth of oyster mushroom (*Pleurotus* spp.) in submerged culture

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The effect of twenty four chemical nutrients on the mycelial growth of five species of *Pleurotus* was determined in submerged culture. All the chemicals except elemental sulphur supported higher mycelial dry weight of test fungi compared to control. Highest average mycelial dry weight (237.1 mg) of *Pleurotus* species was recorded in the basal medium enriched with ferrous sulphate closely followed by ferric chloride (236.1 mg). Copper sulphate and cupric acetate also sustained appreciable dry weights (205.1-213.6 mg) of mushroom fungi. *P. flabellatus* was more responsive to the nutrients than other species. Iron (10 ppm) and copper salts (1-5 ppm) appeared to be more stimulating for mycelial growth.

Key words : Nutrients, mycelial growth, *Pleurotus* spp.

INTRODUCTION

Mushroom fungi probably contain almost all the chemical nutrients present in their growth substrates. The requirement of these nutrients for the growth of mushroom species is not easily demonstratable because of the minute quantities required by the fungal mycelia. Several workers have reported the chemical nutrient requirement of oyster mushroom (Jandaik, 1976; Kurtzman and Zadrazil, 1982; Mehta, 1985). However, these studies were confined to limited number of chemical elements and/or fewer species. Informations regarding comparative ability of different species of *Pleurotus* to utilize a wide rage of nutrient elements are almost lacking. In the present study, the effect of twenty four different chemical nutrietns, either in elemental or complex forms, on the mycelial growth of five species of *Pleurotus* was studied in submerged culture.

MATERIALS AND METHODS

Pure cultures of oyster mushroom viz. *Pleurotus sajor-caju* (ITCC No 1725), *P.florida* (ITCC No. 3831), *P. citrinopilealus* (ITCC No 4346), *P. sapidus* (ITCC No. 3620) and *P. flabellatus* (ITCC No 3833) were collected from Indian Type Culture Collectio, IARI, New Delhi. The cultures were maintained on potato dextrose agar (PDA) slants at 15°C with regular subculturing at fortnight interval.

Twenty four chemical nutrients, either in elemental or complex form viz. sodium as sodoium nitrate, sodium carbonate, sodium sulphate and sodium chloride; potassium as

potassium chloride, potassium monohydrogen phosphate, potassium dihydrogen phosphate, potassium sulphate and potassium hydroxide; calcium as calcium chloride, calcium sulphate and calcium carbonate; magnesium as magnesium sulphate and magnesium chloride; zinc as zinc sulphate; iron as ferrous sulphate and ferric chloride; copper as copper sulphate and cupric acetate; elemental sulphur; boron as boric acid; molybdenum as ammonium molybdate and manganese as manganese sulphate and manganese chloride were used to find out for their effect on the mycelial growth of *Pleurotus* species in submerged culture. Trace elements present in different analytical grade of chemicals as impurities were removed by Steinberg's method (1950). Patato dextrose broth (peeled potato-200 g, dextrose-20 g and distilled water -1000 ml) was used as the basal medium in the study. Different chemicals were mixed with 100 ml of medium spearately in 250 ml conical flasks and sterilized in autoclave at 15 Ib p.s.i for 15 minutes. Basal medium without any test chemical served as control. The media were inoculated with mycelial disc (5 mm diameter) of individual fungus. The conical flasks were incubated at 25±2°C after which the mycelial were harvested by filtering through Whatman No. 1 filter paper. The fungal mats were dried in hot air oven at 60°C for 2 h and weighted till constant weights were achieved. The data were subjected to statistical analysis.

In another experiment, the chemical nutrients which appeared to be promising were assayed at different concentrations to stimulate the growth of test fungi.

RESULTS AND DISCUSSION

Mycelial dry weights of *Pleurotus* species recorded in response to different chemical nutrients in the submerged culture varied widely (Table 1). All the chemicals except elemental sulphur sustained higher mycelial dry weights of test fungi compared to control. The average mycelial dry weight of *Pleurotus* species was highest (237.1 mg) in the basal medium supplemented with ferrous sulphate closely followed by ferric chloride (236.1 mg). Among these fungi, *P. flabellatus* responded better to these nutrients followed by *P. citrinopileatus, P. sapidus, P. sajor-caju and P. florida*. Earlier Treschow (1944) and Bohus (1959) have reported the importance of iron for the growth and development of cultivated mushrooms. beside irons, copper in the form of copper sulphate and cupric acetate also supported appreciable mycelial dry weights (205.1-213.6 mg) of *Pleurotus* species. Copper sulphate was more effectively utilized by fungal mycelia compared to cupric acetate. Sulphate of manganese and magnesium could sustain satisfactory vegetative multiplication. There was only a marginal increase in mycelial yield over control when potassium hydroxide was supplemented in the culture medium. Elemental sulphur appeared to be toxic to mycelial growth of test fungi as it induced the least mycelial dry weight (116.2 mg) of mushroom species.

It was further revealed (Table 2) that the dry mycelial weights of all the fungi increased with the inrease in concentration of iron and copper from 1-10 ppm in the basal medium. However, the enhancement in mycelial yields in response to ferrous sulphate and ferric chloride was more pronounced with the maximum dry weights recorded at 10 ppm concentration. This is in concurrence with the report of Jandaik (1976) who obtained increased growth of *P. sajor-caju* with 10 ppm ferric chloride. Addition of copper in the form of copper sulphate and cupric acetate increased the mycelial dry weights appreciably

from 1-5 ppm after which it was only marginal. It might have been due to the possible

Table 1 : Effect of chemical nutrients on the growth of some species of *Pleurotus*

Chemical nutrients	Mycelial dry weight (mg)					
	P. sajor caju	*P. florida*	*P.citrino-pileatus*	*P.sapidus*	*P. flabellatus*	*Mean*
Sodium chloride	161.3	153.0	174.5	170.6	183.4	131.8
Sodium nitrate	138.3	124.6	151.3	148.6	160.0	144.5
Sodium carbonate	127.8	125.6	141.3	135.3	146.3	135.2
Sodium sulphate	112.3	114.8	130.4	121.3	130.4	121.8
Potassium chloride	121.6	120.4	138.4	129.3	141.3	130.2
Potassium monohydrogen phosphate	130.6	129.3	145.8	140.0	151.3	139.4
Potassium di-hydrogen phosphate	173.3	161.6	156.4	176.3	196.3	172.7
Potassium sulphate	117.8	119.3	131.3	125.3	137.4	126.2
Potassium hydroxide	116.6	118.1	120.8	121.3	130.4	121.4
Calcium chloride	146.3	141.3	156.6	154.3	167.6	153.2
Calcium sulphate	120.5	119.3	137.8	131.4	138.9	129.5
Calcium carbonate	151.3	155.9	169.3	161.3	174.4	162.4
Magnesium sulphate	191.1	170.0	200.4	201.3	211.6	194.8
Magnesium chloride	140.1	135.4	159.3	154.3	159.9	149.8
Zinc sulphate	176.8	165.4	191.5	185.3	195.6	182.9
Ferrous sulphate	234.6	201.4	251.3	244.3	254.3	237.1
Ferric chloride	218.1	225.0	248.1	238.3	251.3	236.1
Copper sulphate	210.3	187.3	220.3	220.3	230.0	213.6
Cupric acetate	200.3	186.3	209.3	210.4	219.3	205.1
Sulphur	115.3	111.8	117.8	118.5	117.8	116.2
Boric acid	156.7	143.4	167.3	166.7	175.5	161.9
Ammonium molybdate	171.6	151.3	189.3	181.3	191.3	196.5
Manganese sulphate	183.5	197.1	195.3	203.4	130.4	119.1
Manganese chloride	113.6	117.4	125.1	120.3	203.3	122.5
Control	110.3	115.5	120.3	119.3	134.6	119.1
Mean	148.1	147.6	156.8	163.1	173.3	
CV%	3.12	1.32	1.68	1.39	1.08	
SE(m) ±	2.76	1.12	1.60	1.30	1.04	
CD at 5%	7.81	3.18	4.55	3.70	2.95	

Each observation is the average of three determinations.

Table 2 : Effect of different concentration of chemical nutrients on the growth of some species of *Pleurotus*

Chemical nutrients	Concentration (ppm)	Mycelial dry weight (mg)					
		P.sajor-caju	*P. florida*	*P.citrino-pileatus*	*P. sapidus*	*P.flabe-llatus*	Mean
Ferrous sulphate	1	211.3	186.4	230.6	223.8	227.8	215.9
	5	231.5	200.9	249.1	245.4	253.1	236.0
	10	243.8	218.5	259.9	254.3	271.3	249.5
Ferric chloride	1	210.3	217.5	230.8	221.8	234.8	223.2
	5	220.4	224.1	241.5	237.0	250.2	234.6
	10	231.5	235.3	260.3	246.5	264.4	247.6
Copper sulphate	1	199.1	170.8	205.3	206.8	219.5	200.3
	5	209.3	181.4	218.5	213.4	228.7	210.2
	10	211.5	187.8	220.3	215.1	232.4	213.4
Cupric acetate	1	180.1	170.3	190.8	197.8	200.8	187.9
	5	199.5	180.4	207.4	209.0	214.7	202.2
	10	201.5	184.3	210.5	212.7	219.3	205.6
Control		109.3	116.4	118.7	117.8	129.9	118.4
Mean		204.5	190.3	218.7	215.4	226.6	

Each observation is the average of three determinations.

toxicity of copper salts to the mushroom fungi at higher concentration. Mehta (1985) has similarly recorded 3-5 ppm copper to enhance the growth of *P. sapidus*.

REFERECES

Bohus, G. (1959). Investigations concerning the life processes of cultivated mushrooms. *Mushroom Sci.* **4** : 86-131.

Jandaik, C.L. (1976). Trace element nutrition of mushroom *Pleurotus sajor-caju* (Fr.) Singer. *Curr. Sci.* **45** : 604.

Kurtzman, R.H. Jr. and Zadrazil, F. (1982). Physiological and taxonomical consideration for cultivation of *Pleurotus* mushrooms. *In : Tropical Mushroom-Biological nature and cultivation methods.* by S.T. Chang and T.H. Quimio pp. 299-348.

Mehta, K.B. (1985). Studies on physiological and cultivation of *Pleurotus sapidus* (Schulzer) Kalch. Ph.D. Thesis. Himachal Pradesh Krishi Viswa Vidyalay, Solan, India.

Steinberg, R.A. (1950). Growth of fungi in synthetic nutrient solution II. *Bot. Rev.* **33** : 208-28.

Treschow, C. (1944). Nutrition of cultivated mushroom *Dansk. Bot. Arkiv.* **11** : 1-180.

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